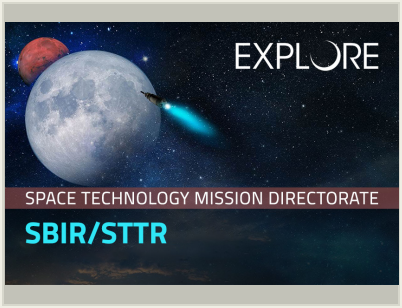
FDM-HAWK, A High Performance Compact Modular Solar Array, Phase I

Completed Technology Project (2011 - 2011)

Project Introduction

Developing a next generation high performance solar array with significant reduction in size and weight will result in improved NASA mission capabilities at lower cost. Photovoltaic cell technology is evolving rapidly to the point solar array structural and mechanical systems do not fully optimize system level mass and volume performance potential. MMA Design LLC (MMA) proposes to develop a compact deployable modular solar array concept with next generation cost and performance improvements. A solar array is proposed that is mechanically simple while meeting the support requirements of currently available solar cells, as well as future higher performance cells. The solar array decreases production and system costs through modularity and simplicity, increases the power to stowed volume ratio (W/m3), and increases specific power (W/kg), thus exceeding the performance of the existing state-of-the-art (SOA) systems. MMA proposes to advance the SOA in photovoltaic power systems by developing a Fan Deployed Modular High Watts per Kilogram (FDM-HaWK) advanced solar array consisting of an innovative fan deployed structure. On-going research at MMA in innovative and manufacturable solar array components, mechanisms and deployable structures makes the proposed solar array feasible and lower risk. The proposed FDM-HaWK uses many identical modular solar array panels in two-string configurations to reduce cell stringing and laydown costs. The significance to NASA of our innovative solution is the reduction of solar array costs while producing over 300 watts per kilogram (W/kg) with 32% efficient next generation solar cells in a 5.6 kW solar array wing. Based on current projections for next generation cell performance by Spectrolab, the proposed system will be capable of producing over 350 W/kg by the year 2017. From the perspective of packaging efficiency, the FDM-HaWK will produce 51 kW/m3 with existing qualified triple junction cells and 63 kW/m3 by the year 2017.



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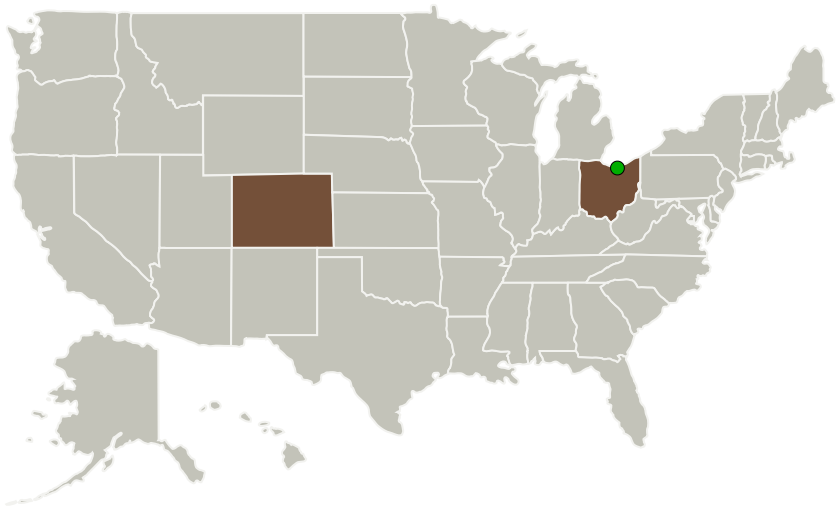
Primary U.S. Work Locations and Key Partners



Organizations Performing Work	Role	Type	Location
MMA Design LLC	Lead Organization	Industry	Loveland, Colorado
Glenn Research Center(GRC)	Supporting Organization	NASA Center	Cleveland, Ohio

Primary U.S. Work Locations	
Colorado	Ohio

Project Transitions

February 2011: Project Start

September 2011: Closed out

Closeout Documentation:

- Final Summary Chart*(https://techport.nasa.gov/file/138159)*

Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Organization:

MMA Design LLC

Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

Project Management

Program Director:

Jason L Kessler

Program Manager:

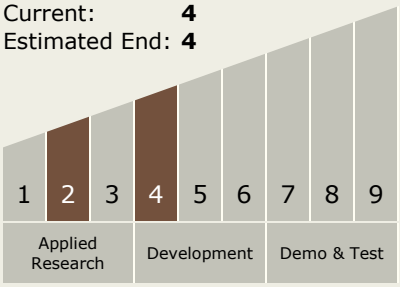
Carlos Torrez

Principal Investigator:

Thomas C Harvey

Technology Maturity (TRL)

Start: **2**
Current: **4**
Estimated End: **4**



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Technology Areas

Primary:

- TX03 Aerospace Power and Energy Storage
  - TX03.1 Power Generation and Energy Conversion
    - TX03.1.1 Photovoltaic

Target Destinations

The Sun, Earth, The Moon, Mars, Others Inside the Solar System, Outside the Solar System